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EXAMINER	
MOORE, KARLA A	

ART UNIT	PAPER NUMBER
1763	

DATE MAILED: 07/22/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/982,954	SANDHU ET AL.	
	Examiner	Art Unit	
	Karla Moore	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 February 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,6-14,16,17 and 46-48* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,6-14,16,17 and 46-48* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1, 6-8, 10-14 and 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,319,553 to McInerney et al. in view of U.S. Patent No. 5,935,334 to Fong et al. and U.S. Patent No. 6,527,866 to Matijasevic et al.

3. McInerney et al. disclose the invention substantially as claimed, including: a multi chamber deposition apparatus (Figure 10) for processes such as atomic layer doping, where simultaneous processing of wafers in separate regions is desired (column 3, row 9). The apparatus comprises a plurality of regions (column 3, row 29; Figure 10, 112, 114, 116, and 118) and a centrally located loading assembly (Figure 3, 104; column 4, row 21) for moving substrates from one region to another. The plurality of regions can be separated into two pairs of regions, so that, in each pair of regions a first region (112 or 116) is capable of applying a first gas species and a second region (114 or 118) is capable of a second processing step (column 5, row 14). All regions are adjacent and chemically isolated form one another by an inert gas curtain of argon (Figure 1, 210; column 8, row 37).

4. Similar to the claimed invention, the loading assembly is capable of moving a plurality of substrates through all four regions sequentially or in a predefined pattern (column 5, row 5). Thus, a plurality of substrates can be treated simultaneously in respective pairs of first and second regions and then transferred to another plurality of regions.

5. However, McInerney et al. fail to teach a first atomic layer region used for deposition and a second atomic layer region used for thermal diffusion of the dopant species.

6. Fong et al. teach deposition of a dopant species in a first processing region and transfer to a second processing region, such as an annealing chamber or a rapid thermal process reactor, for the purpose of driving in the dopant atoms (column 41, row 61 through column 42, 12).

7. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a first atomic layer doping region for deposition and a second atomic layer doping region for thermal treatment in McInerney et al. in order to diffuse the dopant atoms as taught by Fong et al.

8. McInerney et al. and Fong et al. disclose the invention substantially as claimed and as described above. In addition to what is described above both McInerney et al. and Fong et al. teach heating of the substrate. For instance, Fong et al. disclose the use of a heating assembly housed within a wafer pedestal for the purpose of transferring heat to the wafer during processing. Examiner realizes that the heating assembly in Fong et al. is actually located in the susceptor/pedestal, rather than under the pedestal. However, the courts have ruled that the mere rearrangement of parts which does not modify the operation of a device is prima facie obvious. In re Japikse, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950). In re Kuhle, 526 F.2d 553, 188 USPQ 7 (CCPA 1975).

9. However, McInerney and Fong et al. fail to disclose separate heaters for each processing regions.

10. Matijasevic et al. teach the use of individual heaters (Figure 1, 106; column 5, rows 28-31 and column 9, rows 39-43) in each reaction zone of a multi-zone processing apparatus for the purpose of tailoring the temperature to the desirable reaction or reaction rate in a particular reaction zone.

11. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided individual heaters for each region in McInerney et al. and Fong et al. in order to tailor the temperature to the desirable reaction or reaction rate in a particular reaction zone/region as taught by Matijasevic et al.

12. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over McInerney et al., Fong et al. and Matijasevic et al. as applied to claims 1, 6-8, 10-14 and 16-17 above, and further in view of U.S. Patent No. 6,207,005 B1 to Henley et al.

13. McInerney et al., Fong et al. and Matijasevic et al. disclose the invention substantially as claimed and as described above. Additionally, McInerney et al. teach that there is no limitation as to the specific number of chambers that can be used (column 3, row 26).

14. However, McInerney et al., Fong et al. and Matijasevic et al. fail to teach an apparatus comprising a third pair of atomic layer doping regions.

15. Henley et al. disclose a deposition apparatus comprising 3 pairs of deposition regions (Figure 1).

16. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided an additional pair of deposition regions in McInerney et al., Fong et al. and Matijasevic et al. in order to increase the throughput of the deposition apparatus as taught by Henley et al.

17. Claim 46 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,319,553 to McInerney et al. in view of U.S. Patent No. 5,935,334 to Fong et al. and European Patent Application No. 0 060626 to Gattuso et al.

18. McInerney et al. disclose the invention substantially as claimed, including: a multi chamber deposition apparatus (Figure 10) for processes such as atomic layer doping, where simultaneous processing of wafers in separate regions is desired (column 3, row 9). The apparatus comprises a plurality of regions (column 3, row 29; Figure 10, 112, 114, 116, and 118) and a centrally located loading assembly (Figure 3, 104; column 4, row 21) for moving substrates from one region to another. The plurality of regions can be separated into two pairs of regions, so that, in each pair of regions a first region (112 or 116) is capable of applying a first gas species and a second region (114 or 118) is capable of a second processing step (column 5, row 14). All regions are adjacent and chemically isolated form one another by an inert gas curtain of argon (Figure 1, 210; column 8, row 37).

19. Similar to the claimed invention, the loading assembly is capable of moving a plurality of substrates through all four regions sequentially or in a predefined pattern (column 5, row 5). Thus, a plurality of substrates can be treated simultaneously in respective pairs of first and second regions and then transferred to another plurality of regions.

20. However, McInerney et al. fail to teach a first atomic layer region used for deposition and a second atomic layer region used for thermal diffusion of the dopant species.

21. Fong et al. teach deposition of a dopant species in a first processing region and transfer to a second processing region, such as an annealing chamber or a rapid thermal process reactor, for the purpose of driving in the dopant atoms (column 41, row 61 through column 42, 12).

22. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a first atomic layer doping region for deposition and a second atomic layer doping region for thermal treatment in McInerney et al. in order to diffuse the dopant atoms as taught by Fong et al.

23. McInerney et al. and Fong et al. disclose the invention substantially as claimed and as described above.

24. However, McInerney et al. and Fong et al. fail to teach an inert gas curtain provided at a higher pressure than said first dopant species.

25. Gattuso et al. teach the use of an inert gas curtain provided at a pressure somewhat higher than that of the reaction gases within the chamber to create an effective, non-reactive gas curtain (abstract).

26. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided an inert gas curtain at a higher pressure than the reaction gases in McInerney and Fong et al. in order to create an effective and non-reactive gas curtain as taught by Gattuso et al.

27. Claim 47 rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,319,553 to McInerney et al. in view of U.S. Patent No. 5,935,334 to Fong et al., European Patent Application No. 0 060626 to Gattuso et al. and U.S. Patent No. 5,382,126 to Hartig et al.

28. McInerney et al. disclose the invention substantially as claimed, including: a multi chamber deposition apparatus (Figure 10) for processes such as atomic layer doping, where simultaneous processing of wafers in separate regions is desired (column 3, row 9). The apparatus comprises a plurality of regions (column 3, row 29; Figure 10, 112, 114, 116, and 118) and a centrally located loading assembly (Figure 3, 104; column 4, row 21) for moving substrates from one region to another. The plurality of regions can be separated into two pairs of regions, so that, in each pair of regions a first region (112 or 116) is capable of applying a first gas species and a second region (114 or 118) is capable of a second processing step (column 5, row 14). All regions are adjacent and chemically isolated form one another by an inert gas curtain of argon (Figure 1, 210; column 8, row 37).

29. Similar to the claimed invention, the loading assembly is capable of moving a plurality of substrates through all four regions sequentially or in a predefined pattern (column 5, row 5). Thus, a plurality of substrates can be treated simultaneously in respective pairs of first and second regions and then transferred to another plurality of regions.

30. However, McInerney et al. fail to teach a first atomic layer region used for deposition and a second atomic layer region used for thermal diffusion of the dopant species.

31. Fong et al. teach deposition of a dopant species in a first processing region and transfer to a second processing region, such as an annealing chamber or a rapid thermal process reactor, for the purpose of driving in the dopant atoms (column 41, row 61 through column 42, 12).

32. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a first atomic layer doping region for deposition and a second atomic layer doping region for thermal treatment in McInerney et al. in order to diffuse the dopant atoms as taught by Fong et al.

33. Additionally, McInerney discloses that each of the gases can be connected to any number of gas supplies so that several different gases can independently controlled to flow through each showerhead

(column 5, rows 14-20). This is interpreted as: any of the gas supplying showerheads (specifically those in the second region) is capable of being connected to a non-reactive gas supply source. When combined with Fong et al., as detailed above, one is left with first and second doping regions capable of depositing a doping species in a first region and allowing that species to diffuse with the assistance of a non-reactive gas in a second region.

34. Examiner realizes that the prior art fails to explicitly teach the use of a non-reactive gas in a second region. However, this is seen as an intended use of which the prior art would be capable. The courts have ruled that expressions relating the apparatus to the contents thereof during an intended operation are of no significance in determining the patentability of the apparatus claim. Ex parte Thibault, 164 USPQ 666, 667 (Bd. App. 1969).

35. McInerney et al. and Fong et al. disclose the invention substantially as claimed and as described above.

36. However, McInerney et al. and Fong et al. fail to teach an inert gas curtain provided at a higher pressure than said first dopant species.

37. Gattuso et al. teach the use of an inert gas curtain provided at a pressure somewhat higher than that of the reaction gases within the chamber to create an effective, non-reactive gas curtain (abstract).

38. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided an inert gas curtain at a higher pressure than the reaction gases in McInerney and Fong et al. in order to create an effective and non-reactive gas curtain as taught by Gattuso et al.

39. McInerney et al., Fong et al. and Gattuso et al. disclose the invention substantially as claimed and as described above.

40. However, McInerney et al., Fong et al. and Gattuso et al. fail to teach a separate gas exhaust for each region in a multi-chamber coating apparatus.

41. Hartig et al. teach the use of separate gas exhausts in each chamber for the purpose of aspirating gas from each chamber and further preventing gas transfer between the individual chambers (column 2, rows 17-22).

42. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided separate exhaust mechanisms in each chamber in McInerney et al., Fong et al. and Gattuso et al. in order to aspirate each chamber and further prevent gas transfer between the individual chambers as taught by Hartig et al.

43. Claim 48 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,319,553 to McInerney et al. in view of U.S. Patent No. 5,935,334 to Fong et al., U.S. Patent No. 6,527,866 to Matijasevic et al. and U.S. Patent No. 6,056,849 to Straemke.

44. McInerney et al. disclose the invention substantially as claimed, including: a multi chamber deposition apparatus (Figure 10) for processes such as atomic layer doping, where simultaneous processing of wafers in separate regions is desired (column 3, row 9). The apparatus comprises a plurality of regions (column 3, row 29; Figure 10, 112, 114, 116, and 118) and a centrally located loading assembly (Figure 3, 104; column 4, row 21) for moving substrates from one region to another. The plurality of regions can be separated into two pairs of regions, so that, in each pair of regions a first region (112 or 116) is capable of applying a first gas species and a second region (114 or 118) is capable of a second processing step (column 5, row 14). All regions are adjacent and chemically isolated form one another by an inert gas curtain of argon (Figure 1, 210; column 8, row 37).

45. Similar to the claimed invention, the loading assembly is capable of moving a plurality of substrates through all four regions sequentially or in a predefined pattern (column 5, row 5). Thus, a plurality of substrates can be treated simultaneously in respective pairs of first and second regions and then transferred to another plurality of regions.

46. However, McInerney et al. fail to teach a first atomic layer region used for deposition and a second atomic layer region used for thermal diffusion of the dopant species.

47. Fong et al. teach deposition of a dopant species in a first processing region and transfer to a second processing region, such as an annealing chamber or a rapid thermal process reactor, for the purpose of driving in the dopant atoms (column 41, row 61 through column 42, 12).

48. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided a first atomic layer doping region for deposition and a second atomic layer doping region for thermal treatment in McInerney et al. in order to diffuse the dopant atoms as taught by Fong et al.

49. McInerney et al. and Fong et al. disclose the invention substantially as claimed and as described above. Additionally, both McInerney et al. and Fong et al. teach heating of the substrate. Fong et al. disclose the use of a heating assembly housed within a wafer pedestal for the purpose of transferring heat to the wafer during processing. Examiner realizes that the heating assembly in Fong et al. is actually located in the susceptor/pedestal, rather than under the pedestal. However, the courts have ruled that the mere rearrangement of parts which does not modify the operation of a device is prima facie obvious. In re Japikse, 181 F.2d 1019, 86 USPQ 70 (CCPA 1950). In re Kuhle, 526 F.2d 553, 188 USPQ 7 (CCPA 1975).

50.

51. However, McInerney et al. and Fong et al. fail to teach the use of individual heaters for each processing region.

52. Matijasevic et al. teach the use of individual heaters (Figure 1, 106; column 5, rows 28-31 and column 9, rows 39-43) in each reaction zone of a multi-zone processing apparatus for the purpose of tailoring the temperature to the desirable reaction or reaction rate in a particular reaction zone.

53. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided individual heaters for each region in McInerney et al. and Fong et al. in order to tailor the temperature to the desirable reaction or reaction rate in a particular reaction zone/region as taught by Matijasevic et al.

54. McInerney et al., Fong et al. and Matijasevic et al. disclose the invention substantially as claimed and as described above.

55. However, McInerney et al., Fong et al. and Matijasevic et al. fail to teach a physical barrier present between adjacent deposition regions.

56. Straemke teaches the use of a closeable, gas tight door (Figure 1, 12) to isolate the deposition area of a treatment chamber and discloses that multiple processing areas can be separated using the doors (column 3, row 50).

57. It would have been obvious to one of ordinary skill in the art at the time the Applicant's invention was made to have provided gas tight doors as means of physically separating deposition regions in McInerney et al., Fong et al. and Matijasevic et al. in order to provide more effective isolation of adjacent chambers, which results in decreased contamination between the chambers.

Response to Arguments

58. Applicant's arguments filed 12 February 2004, with respect to the rejections made in the previous office action have been fully considered but they are not persuasive. Additionally, Applicant's arguments with respect to newly amended claims have been considered but are moot in view of the new ground(s) of rejection. The Matijasevic et al. reference has been incorporated into the rejections for its teachings of a plurality of heaters provided for a plurality of processing regions in order to maintain individual processing temperatures in each of the regions.

59. Applicant's arguments, with respect to McInerney, regarding the use of an inert gas curtain provided at a higher pressure than the first and second gas species, have been considered, but are not persuasive. Examiner does not agree that McInerney teaches away from supplying an inert gas curtain provided at a higher pressure than the first and second gas species. Rather, McInerney is silent on the pressure at which the inert gas is supplied. Examiner notes that the delivery of a "uniform flow of inert gas" does not imply a particular pressure. However, as mentioned in the previous office action, it would be pointless to provide a gas curtain at a lower pressure than the reaction gases, as it would not

separate, but mix with the reaction gases. This would have been obvious to one of ordinary skill in the art at the time the invention was made. Gattuso et al. support this reasoning.

60. With respect to Applicant's arguments regarding the teachings of McInerney and separate/single gas port(s), where Applicant has referred back to Examiner's remarks in the previous office action regarding the motivation for combination with Hartig et al., Examiner points out (as was also pointed out in the previous office action) **motivation for the combination is found in Hartig et al.** Examiner did not (and does not) suggest that no motivation is needed for the combination of the references, rather that it is not necessary for both of the references to provide motivation for the combination. Motivation in a single reference is sufficient. Applicant has taken Examiner's remarks out of context, as this was also clearly expressed in the previous office action. Examiner also notes that McInerney et al. does in fact suggest that separate exhaust ports/mechanisms can be provided for each processing region at column 4, row 67 through column 5, row 2.

61. Applicant's arguments with respect to the modification of McInerney to have a physical barrier having a closeable opening have been considered but are not persuasive, either. With respect to Applicant's argument regarding the inappropriateness of providing a physical barrier in McInerney, Examiner notes that the presence of multiple structures in an apparatus for accomplishing prevention of the same problem (for instance, maintaining a separation of adjacent processing regions) is not nullifying. "Complementary structures" for performing a common task are a well-known concept. In many cases the presence of "complementary structures" (for instance, a physical barrier and a chemical barrier) leads to enhanced results.

Conclusion

62. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Examiner calls attention to the disclosure of Suntola et al. The reference discloses a multi region atomic layer deposition device and also discloses the use of the apparatus for doping (column 11, rows 21-27). Kiss teaches the use of complementary/supplementary gas separation mechanisms. Tsai, a CVD apparatus that is disclosed as combinable with the invention of Suntola et al. (see column 4, rows 5-9),

teaches the use of an inert purge between adjacent processing regions for applying differing materials. Each of the regions is rotated to in a way similar to the disclosed invention and Suntola et al. Sussman teaches the use of an inert gas curtain provided at a higher pressure than the processing region it is meant to isolate.

63. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karla Moore whose telephone number is 571.272.1440. The examiner can normally be reached on Monday-Friday, 8:30am-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on 571.272.1439. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

km
16 July 2004

P. Hassanzadeh

Parviz Hassanzadeh
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